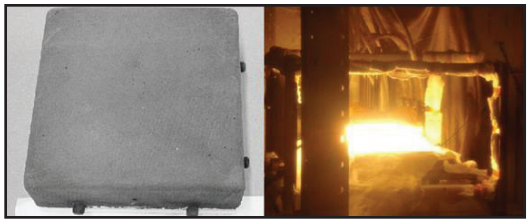
# AFRL TESTS AEROGEL-FILLED CARBON FOAM TPS CONCEPT



AFRL researchers recently used the lab's Structural Test Facility to complete successful testing of an advanced aerogel-filled carbon foam and oxidation-resistant composite structural shell thermal protection system (TPS) component. AFRL is completing this interdisciplinary development effort under contract to Ultramet (Pacoima, California).

The combination of aerogel-filled carbon foam with a refractory composite outer shell has the potential to structurally enhance a TPS outer surface while providing the necessary thermal insulation to maintain the substructure at safe operating temperatures. The state-of-the-art TPS employed on the space shuttle orbiter comprises lightweight silica-based tiles that provide no benefit to the structural performance of the airframe. AFRL's new concepts are pushing the technology toward the more structurally and thermally efficient designs that the Air Force must have in order to meet the rapid-turnaround requirements of future military systems.

During the testing, researchers used graphite resistance heating elements to heat the face of the TPS component to 3500°F for three, 5-minute cycles. The tests demonstrated concept effectiveness, with the aerogel-filled carbon foam successfully decreasing the cool-side temperature of the TPS component by ~2400°F over a material thickness of <1.5 inches. The successful testing proved the capacity of the TPS component to maintain its integrity under high-temperature conditions while demonstrating very effective insulative capabilities. This material has potential application as part of a scramjet [supersonic combustion ramjet] engine flowpath liner, for protecting the vehicle's lower-temperature components from engine heat.

**For additional information on this technology contact AFRL/VA afrl.va.marketing@wpafb.af.mil, (937)255-2074.**
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